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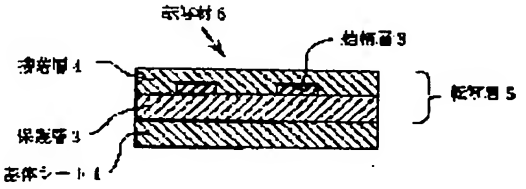
(54) ACTIVE ENERGY RAY HARDENING RESIN COMPOSITION USED FOR TRANSFER MATERIAL AND PROTECTIVE LAYER FOR TRANSFER MATERIAL AND MANUFACTURE OF MOLDED PRODUCT OF SUPERIOR WEAR RESISTANCE AND CHEMICAL RESISTANCE USING TRANSFER MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To manufacture a molded product of superior wear resistance and chemical resistance at low cost and eliminate the generation of cracks by containing a polymer having acryl equivalent, hydroxyl value and weight average molecular weight in the specified range and multifunctional isocyanate in an active energy ray hardening resin composition.
SOLUTION: A protective layer 2 is released from a base sheet 1 or a release layer to form an outermost layer of a transfer material when the base sheet 1 is released after transfer or molding simultaneous transfer, and a molded product and back layer 3 are protected from chemicals and friction. For the purpose of forming the protective layer 2, an active energy ray hardening resin composition containing a polymer having the acryl equivalent amount of 100-300g/eq, hydroxyl value of 20-500 and weight average molecular weight of 5000-50000 and multifunctional isocyanate as effective components is used. A molded product of superior wear resistance and chemical resistance can be provided by the arrangement, and cracks are not generated on the curved face sections of the molded product.



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A. Relevance of the above-identified Document

This document has relevance to all claims of the present application.

B. Translation of the Relevant Passages of the Document

[DETAILED DESCRIPTION OF THE INVENTION]

[MEANS TO SOLVE THE PROBLEMS]

[0010]

An active energy ray hardening resin composition used as the protective layer of the transfer material of the present invention is arranged so as to contain as effective components, a polymer having a (meta-)acryl equivalent amount of from 100 g/eq to 300 g/eq, hydroxyl value of from 20 to 500, and weight average molecular weight of from 5000 to 50000; and multifunctional isocyanate.

[0013]

A transfer material is arranged so that a protective layer formed on a releasing base sheet is made of a product obtained by a thermal cross-linking reaction of the foregoing active energy ray hardening resin composition.

[0014]

The foregoing transfer material is arranged so that a pattern layer and an adhesive layer are sequentially formed on the protective layer.

[0015]

··· comprising the steps of removing the base sheet and irradiating an active energy ray, after adhering the transfer material to a surface of the molded product.

[EMBODIMENTS]

[0019]

The releasing base sheet 1 may be resin sheet such as polypropylene resin, polyethylene resin, polyamide resin, polyester resin, polyacrylic resin, and polyvinylchloride resin.

[0020]

The release layer may be made of a material such as melamine resin release agent, silicon resin release agent, fluorocarbon resin release agent, cellulosic release agent, urea resin release agent, polyorefin resin release agent, paraffin release agent, and a compound release agent of the above-mentioned release agents.

[0026]

The multifunctional isocyanate used in the present invention together with the polymer is not limited, and may be various types of known multifunctional isocyanate. Examples include isophorone diisocyanate, xylylene

diisocyanate, hydrogenerated xylylene diisocyanate, trylene diisocyanate, diphenyl methane diisocyanate, 1,6-hexane diisocyanate, trimer of the above diisocyanate, and pre-polymer prepared by reacting the above diisocyanate with polyhydric alcohol. Reasons the multifunctional isocyanate is used together with the polymer in the present invention are, when the pattern layer 3 and the adhesive layer 4 are formed on the protective layer 2, to retain low adhesion of the protective layer 2 before an active energy ray is irradiated; and to satisfy the resistance of the protective layer 2 with respect to a solvent contained in ink that forms the pattern layer 3 and the adhesive layer 4. In other words, the reasons are to impart the above performance by reacting hydroxyl contained in the polymer with isocyanate in the multifunctional isocyanate so as to form a minor thermal cross-linking product.

[0028]

Further, the active energy ray hardening resin composition used as the protective layer 2 may contain, if necessary, a component such as reactive diluting monomer, solvent, coloring agent, and the like, other than the polymer and multifunctional isocyanate. Further, if electron ray is used in the active energy ray irradiation, photopolymerization initiator is not required, but if

ultraviolet ray is used, it is necessary to add various types of known photopolymerization initiator.

[0030]

The active energy ray hardening resin composition is cross-linked by both heat and an active energy ray.

[0031]

The protective layer 2 may be formed by a coating method such as gravure coating method, roll coating method, comma coating method, and rip coating method.

[0033]

A coating method such as gravure coating method, roll coating method, comma coating method, and rip coating method may be employed in a case of single color printing.

[0034]

The adhesive layer 4 is formed on the protective layer 2 or pattern layer 3 at a desired portion. In other words, if the desired portion is an entire surface, the adhesive layer 4 is formed on the entire surface.

[0038]

Note that, the step of irradiating an active energy ray may be carried out before the step of removing the base sheet 1.

[0039]

The active energy ray may be electron ray,

ultraviolet ray, and γ ray, and the like.

[EXAMPLES]

[0050] Comparative Example A2

After a protective layer in which urethane acrylate having polymeric double bond, reactive diluent, and photopolymerization initiator are combined is formed using a gravure printing method, the protective layer is completely cross-linked and hardened by irradiation of ultraviolet ray when the transfer material is formed, and is not subject to irradiation of ultraviolet ray after the transfer.

[0051] Comparative Example A3

After a protective layer in which urethane acrylate having polymeric double bond, thermoplastic acrylic resin, and photopolymerization initiator are combined is formed using a gravure printing method, the protective layer is subject to the first-stage irradiation of ultraviolet ray when the transfer material is formed, so that the active energy ray hardening resin is half cross-linked and hardened; and then subject to the second-stage irradiation of ultraviolet ray after the transfer, so that the active energy ray hardening resin is completely cross-linked and hardened.